

## **Beyond Borders: The Battle Against Ecological Intrude**

In Hawaii, there is a crazy ant species that was suitable to kill 3 million cranks in 18 months. The brown tree snake has caused major power outages across the islet and occasionally bites people, near complete decimation of Guam's native timber catcalls. These are not horror movie ideas. They are real stories about invasive alien species. According to an exploration of International Union for Conservation of Nature "Invasive alien species (IAS) are animals, plants or other organisms that are introduced into places outside their natural range, negatively impacting native biodiversity, ecosystem services or human well-being". IAS cause significant trouble to ecosystems worldwide, dismembering the balance of native fauna and flora. Understanding the causes and consequences of them is important for developing effective operation generalship to reduce their negative side and cover our natural ecosystems.

Invaders upset the delicate ecosystems, often with devastating consequences. Vector interception or interruption is the fastest way to stop and slow the spread of new invasions, identifying pathways and vectors is important (Carlton & Ruiz 2005). Negative outcomes from species introduction are caused by nature and people, either intentionally or accidentally, through activities like fish farming and commercial agriculture, horticulture, biocontrol. With the hope of improving crop yields or providing a new source of income. For example, because of the country's

fast urbanization and population growth, South Africa faced a shortage of wood, wood products, and other ecosystem services, which its native forest trees could not provide at the slow pace of growth (Poynton, —2009). Introducing non-native species into controlled environments like laboratories or plant gardens can provide educational opportunities for studying their biology and ecological interactions. Some exotic plants or animals are intentionally introduced for aesthetic or entertaining reasons. According to Carbonbrief (2023), Japanese knotweed introduced in the United Kingdom in 1850, quickly spread and is now present in infestation form.

In conjunction with deliberate actions aimed at intentionally introducing invasive species into the environment, there are inadvertent causes that give rise to this circumstance. Overseas trade in commodities and people makes it easier for invasive species to spread accidentally. Animals, plants, and insects migrate to new habitats, becoming invasive through hitchhiking. Pet and plant trades introduce these species, introducing disease contamination and insect pests. Approximately 70% of unintended introductions of invasive species come through trade-related paths (Hulme, 2009). Travel and tourism are not an exceptional occurrence. Humans who move from one area to another may unintentionally bring invasive species with them. It is possible for insects, spores, seeds, or other living things to stick to clothes, shoes, or luggage and move to new areas. In

addition, the functioning of marine ecosystems may be affected by marine infrastructure, which might promote the spread of them.

Climate change can have significant implications for the distribution and establishment of invasive species. Walther and his coworkers (2009) recognize alien species are now able to spread into places where they were previously unable to live and reproduce due to global warming. As temperatures rise and climatic conditions shift, the geographical ranges of many species may change. This range expansion can lead to the establishment of invasive populations in ecosystems. Melting ice in the Arctic creates favorable conditions for certain invasive species, such as snow crabs, as they can adapt to a wider range of temperatures than native species, giving them a competitive advantage in survival and reproduction. Scientists have discovered that in the Barents Sea, the overall biomass of snow crabs is ten times more than that of king crabs. Whereas the snow crab, with the exception of the southern regions where the king crab exists, has expanded over the whole Russian part of the Barents Sea in less than 20 years. Furthermore, the snow crab appears to be crossing the sea without assistance from people (Christi, 2013).

The increasing prevalence of invasive species (IAS) is posing a significant threat to ecosystems worldwide, with a projected increase of 36% by 2050 (Seebens et al., 2021). Understanding the impacts of IAS is

crucial for preserving native species, safeguarding biodiversity, and maintaining ecosystem balance. They can lead to the displacement of native species and negatively impact soil ecosystems, as they often compete for resources such as water, nutrients, and sunlight. In 1937, the introduction of *Miconia calvenscens* to French Polynesia, a large leaves Andean tree (more than 1 meters long), led to significant environmental changes, including reduced light interception, erosion, and landslides (Meyer & Florence, 1996). Invasive plants can create dense monocultures, altering soil structure, composition, and moisture levels, potentially displacing native species reliant on specific conditions. They gain an advantage in habitat, water, and food due to quick growth rates, effective reproduction, or natural predators, potentially leading to their displacement or extinction. European starlings, an invasive bird species, nest in tree cavities, displacing native cavity-nesting species like woodpeckers and bluebirds, disrupting natural nesting dynamics and causing displacement of native species (Walter, 2003).

It is commonly known that the rivalry between alien and native species is a factor in the displacement and eventual extinction of native species, which in turn causes disruption of ecosystems and subsequent environmental changes. According to studies, IAS may change how native species evolve through predation, habitat displacement, competitive exclusion, and eventually extinction (Mooney, 2006). Apart from that, they

can become predators or herbivores in their new habitats, consuming native organisms that may have evolved without natural defenses against them. IAS have an impact on ecosystems through altering trophic structures, altering the availability of resources like nutrients and water, and altering disturbance regimes (McNeely et al., 2001).

IAS significantly impact both ecological dynamics and economic systems, causing significant financial burdens. These species can cause direct economic losses by damaging crops, forests, fisheries, infrastructure, and other assets. A study found that biological incursions could cause losses to the Indian economy of up to \$182.6 billion. Of the 72% of the area, or 254,880 square kilometers, that were invaded by invasive plants of high concern, at least one was found in 53% of the plots (Himanshu, 2023). Controlling IAS incurs significant costs, including prevention, monitoring, eradication programs, research, and public awareness campaigns. These costs strain local, regional, and national budgets and divert resources from other priority areas.

The detrimental implications on key economic sectors, including agriculture, tourism, and healthcare, are also a subject of significant academic concern. These invasions can damage crops, livestock, and forests, leading to reduced yields, increased production costs, and diminished market value. They can also cause trade restrictions and

barriers. According to Naylor's (1996) estimation, the snail invasion in 1990 cost the Philippines' rice cultivation between \$425 millions and \$1200 million, not including the effects on ecosystems and human health that were not related to commerce. Invasions can also alter or degrade ecosystems, diminishing their aesthetic appeal and biodiversity value. This can deter tourists seeking pristine environments and unique wildlife experiences. Mosquitoes can transmit diseases like dengue fever, Zika virus, and malaria, posing significant health risks to local populations and travelers. Monitoring, controlling disease vectors, and implementing public health measures can strain healthcare systems and budgets.

While they are generally associated with negative impacts on ecosystems and human activities, there are a few examples where they have been found to provide potential benefits and sometimes have nutritional benefits, providing a source of food that contributes to human health. *Catharanthus roseus* can exhibit antidiabetic, larvicidal, pupicidal, antioxidant, antibacterial, and anticancer effects (Kumar, 2021). Despite their invasive nature, these species can introduce diseases that pose direct health risks to human populations. *Pomacea Canaliculata*, introduced to the Philippines in 1962, is considered one of the top 100 worst invasive species in the world and produces human eosinophilic meningoencephalitis when consumed (Lowe et al., 2000). IAS can also disrupt ecosystems and contribute to the proliferation of allergenic organisms, exacerbating

respiratory conditions like asthma and allergies. Therefore, while some species may offer potential benefits, the overall impact of invasions on human health and ecosystems remains a concern.

IAS pose a significant threat to the health of plants and animals in ecology and conservation biology. They can disrupt natural ecosystems by outcompeting native plants for resources, altering nutrient cycling, and altering habitat structures. This can lead to reduced plant diversity and loss of ecological relationships. Invasive plants can also harm nearby vegetation, endangering the well-being of native plant species. Additionally, invasive species can introduce diseases to native populations that lack natural immunity or resistance. For example, the Australian brushtail possum, introduced to New Zealand, poses a significant economic risk by spreading bovine tuberculosis to cattle and deer. Millions of dollars are spent annually to battle the possums (Clout, 1999).

In conclusion, IAS are a significant threat to ecosystems and biodiversity in the world. Their intrusion into our environments, whether intentional or unintentional, disrupts ecological balances and can have terrible consequences. Solving the issue of IAS requires a diverse approach that includes prevention, early detection, and effective management strategies. It is important for governments, organizations, and individuals to come together and take proactive measures to prevent the introduction and

spread of invasive species. Raising awareness, implementing biosecurity measures, and supporting scientific research can mitigate the impact of invasive species and safeguard our ecosystems for future generations.

**(1525 words)**